REFUSE CONTAINER LID

FIELD OF THE INVENTION

This invention relates to an improved lid for a refuse container.

BACKGROUND OF THE INVENTION

Large volume refuse containers, commonly called dumpsters, having capacities of several cubic yards or more, are used in many locations such as apartment complexes and the like, so that garbage can be neatly and sanitarily gathered in a central location for collection by a garbage truck. Frequently, containers of an appropriate size to hold a single day's refuse are used, and the containers are dumped daily by the collecting truck to minimize the occurrence of offensive odors from the container. A typical container has a large rectangular box shape and includes a bottom and four side walls, with means, such as fork lift receiving channels, provided whereby the refuse collecting truck can engage the container to raise the container off the ground and invert the container over a bin on the collecting truck to empty the refuse therefrom. Normally, one or more hinged covers or lids are provided on the top of the container, and as the container is inverted over the bin, the lids fall open, permitting the refuse to fall from the container into the bin on the truck. After the container is emptied, it is lowered back onto the ground, and as it is lowered the lids fall to the closed position.

This sounds simple enough, but there are large, conflicting demands placed on lids.

A lid should be sufficiently strong so as to support a load, such as a child or refuse, placed on top. The lid should not buckle or fail under such loads.

A lid should be sufficiently strong to resist the damage during dumping. When the container is inverted and emptied into the truck bin, heavy refuse is sometimes flung against the lid.

When the container is being lowered to the ground, the cover often slams closed forcefully. Often a lid is opened all the way so as to fall back forcefully against the outside back wall. The repetitive forceful opening and closing of the lid can cause structural damage, creating dents and bending the covers out of shape so that the covers will not rotate properly on the hinge or may not close the container completely.

When the container is inverted and emptied into the truck bin, the lids are open and vertical and go down into the truck bin. There, they occasionally are pushed against refuse in the bin. This puts high compressive forces on the front of the lid and the hinge. These forces often severely damage a lid or hinge. A lid should be designed to function in the face of these forces.

It is preferred in such a container that the lids are freely movable about the hinge connection, so that they will open completely and close readily during the dumping operation.

A lid should rotate to a freely open position such that the lid need not be held open.

Preferably, a lid is sufficiently light weight so as to be easily raised by the person placing garbage therein. Since frequently a person will be carrying a bag of garbage in at least one hand, thus having only one hand free for opening the container, it is highly desirable that the cover or covers are easily opened while the container remains on the ground.

Preferably, a lid should be adapted to shed water and snow. Standing water or snow on a lid increases the weight of the lid and may be a source of odor or insects. Water or snow should be directed off the container and not into it.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a front perspective view of a refuse container including two lids of the invention attached to a bin.

Figure 2 is a front top perspective view of a preferred embodiment of the lid of the invention.

Figure 3 is a top plan view of the lid of Figure 2.

Figure 4 is a bottom plan view of the lid of Figure 3.

Figure 5 is an enlarged rear elevation view of the lid of Figure 2.

Figure 6 is an enlarged front elevation view of the lid of Figure 2.

Figure 7 is combined side elevational sectional views of the lid of Fig. 2 taken on lines A1-A1 - D2-D2 of Figure 6.

Figure 8 is a sectional view taken on line 8-8 of Figure 3.

Figure 9 is a sectional view taken on line 9-9 of Figure 3 further including additional lids in stacked configuration.

Figure 10 is a sectional view taken on line 10-10 of Figure 9.

Figure 11 is front top perspective view of an alternate embodiment of the lid of the invention.

DETAILED DESCRIPTION OF THE INVENTION

With reference now to the drawings, Figure 1 is a front perspective view of a dumpster or refuse container 80 including two lids 10 of the invention and a bin 81 for holding refuse.

Bin 81 is a conventional bin typically constructed of strong metal, such as steel. Bin 81 includes a bottom 82 and walls 83. Walls 83 include front wall 83F, back wall 83B, left wall 83L and right wall 83R, projecting upwards from bottom 82. Each wall 83 has an upper end 84 which terminates in a upper edge or lip 85 surrounding top opening 90. Lip 85 generally defines a plane surrounding opening 90.

Lid mounting means 91 for hingedly mounting lid 10 include a pintle or hinge rod 94 supported by two or more mounts 92 attached to upper ends 84 of walls 83. In other bin configurations, mounts 92 may be attached to a permanent partial cover. A pair of lids 10, such as left lid 10L and right lid 10R are mounted to hinge rod 94 so as to be pivotable to the fully vertical upright position and preferably pivotable through approximately 270°. Hinge rod 94 defines a hinge axis 99 about

which lid 10 pivots. A typical hinge rod 94 is a steel rod of one-half inch diameter and six feet in length so as to hold two lids 10.

Mounted on left and right walls 83L, 83R are lift pockets 88, each for receiving a lift arm of a refuse collecting truck.

Although a single exemplary embodiment of a bin 81 is shown and described, it will be seen and should be understood that lid 10 of the invention is applicable for use with a wide variety of bins having different features and that the exemplary bin 81 is not intended to limit the scope of the invention. For example, a bin may have a top partially covering the bin opening. Such a top may be fixed or movable.

Figures 2-6 are views of a preferred embodiment of lid 10. Figure 2 is a front top perspective view. Figure 3 is a top plan view of lid 10 of Fig. 2. Figure 4 is a bottom plan view of lid 10 of Figure 3. Figure 5 is an enlarged rear elevation view of lid 10 of Fig. 2. Figure 6 is an enlarged front elevation view of lid 10 of Fig. 2.

Lid 10 is intended to cover all or a portion of the top opening 90 of a refuse bin 81. Lid 10 is a rectangular panel 20 generally including an upper side 30, a lower side 40, a hinge end 50, an opening end 60, a mid-section 77; a left side 70, and a right side 75.

Hinge end 50 includes connection means 52, such as a plurality of laterally spaced bearings 54, for connecting to the bin's lid mounting means 91, such as to hinge rod 94 such that panel 20 is rotatable about hinge rod 94 and hinge axis 99. Hinge rod 94 includes an outer bearing surface 95. Lid 10 is formed from a resilient thermoplastic and includes integral bearings 54, that are formed directly out of the thermoplastic, for bearing directly on outer surface 95 of hinge rod 94. Thus, there is no need for addition or insertion of other bearing materials, such as metal sleeves. Bearings 54 should be spaced so as to support lid 10 and must be sufficiently strong so as not to fail and particularly not to fail before lid 10 bends as

described below. It is important that bearings 54 not be damaged, as bearing damage may cause the lid not to properly open and close or to not cover the bin. Total strength of bearings 54 is largely dependent upon their total bearing area. Extensive testing to failure has shown that, when bearing area exceeds 10% of the total area of hinge rod 94, failure of the bearings 54 or damage to the bearings goes down. A bearing area exceeding 20%, assures that the failure mode takes place elsewhere. Lid 10, of the exemplary embodiment, has forty four bearings 54 comprising almost 23% of the area (or length) of hinge rod 94, thus assuring that lid 10, as described below, will always yield in another location.

Lid opening end 60 is opposite lid hinge end 50. Opening end 60 includes opening means 62, such as a handle 63, such as raised central portion 64 under which a person may place fingers for opening lid 10.

Upper lip edge or lip 85 of bin front wall 83F supports the periphery or near periphery of lower side 40 of opening end 60. Bin upper edge or lip 85 may support the periphery or near periphery of lower side 40 of either left or right side 70, 75.

Panel 20 is further defined by a plurality of longitudinal corrugations 21 spanning substantially between opening end 60 and hinge end 50 creating a plurality of hills 22 and valleys 26. Corrugations 21 act as a plurality of longitudinal flanged beams for greatly increasing the bending strength of lid 10. Preferably, corrugations 21 have a lateral cross section approximating a sine wave. A sine wave cross section of corrugations 21 facilitates the flow of plastic in the molding process such that the thickness and material strengths are more uniform. Corrugations 21 have a longitudinal neutral bending axis wherein half the moment of inertia is above the neutral axis and half is below.

Lid 10 is adapted for bending upward upon failure in bending mode from compressive forces on front end 60. At opening end 60, hills 22 of corrugations 21 slant down to the same level as

valleys 26 such that opening end 60 is relatively low, essentially at the lowest level of lid 10. At hinge end 50, hinge axis 99 is also relatively low, certainly below the neutral bending axis of corrugations 21, such that a compression line 12 between front end 60 and hinge axis 99 is below the neutral bending axis of lid 10. Since longitudinal compressive forces on lid 10 act on compression line 12 and this is below the neutral bend axis, panel 20 will bend upward in bending failure due to compression loads. This is true even if the corrugations are not longitudinally upwardly arched as shown in the exemplary embodiment.

As best seen in Figures 5 and 6, rear and front elevation views of lid 10, in the mid-section 77 of panel 20, corrugations 21 are upwardly arched laterally, that is the mean height of panel 20 rises toward the center. In the exemplary embodiment, both hills 22 and valleys 26 progressively rise toward the center of panel 20. This lateral arching increases the ability of panel 20 to hold loads, such as a person or weight placed on upper surface 30.

Figure 7 combines side elevational sectional views of the lid of Fig. 2 taken on lines A1-D1 through valleys 26 and lines A2-D2 through hills of Figure 6. Longitudinal compressive forces on lid 10 act on a compression line 12 between front end 60 and hinge axis 99. As seen in Fig. 7, panel 20 is upwardly arched longitudinally. This increases its ability to hold loads, such as a person or weight placed on upper surface 30 and provides for water run off.

Additionally, panel 20 is upwardly arched longitudinally such that the substantial mass is above compression line 12. This predisposes the middle of lid 10 to bend upward upon bending failure due to excessive longitudinal compressive force.

As best seen in Figures 4 and 8, panel 10 includes one or more lateral bend zones or bend sections 13. Figure 8 is a sectional view taken on line 8-8 of Figure 3. Bend sections 13 are predetermined lateral cross-sections of reduced strength that

will fail first in bending mode failure. In panel 10, bend zones 13 are provided where said corrugations have a reduced resistance to bending, such as by having a reduced moment of inertia, such that longitudinal compressive force on said opening end at bend failure buckles said panel at bend zone 13. In panel 20, the lower portions of corrugations 21 along bend zone 13 have a reduced cross-sectional area 14 as seen in Fig. 4 such that longitudinal compressive force on opening end 60 at bend failure buckles lid 10 upward at a bend zone 13.

Figure 11 is a front top perspective view of a lid 10' showing an alternate embodiment. Lid 10' is the same as lid 10 except, instead of the lower portions of corrugations 21 along bend zone 13 having a reduced cross-sectional area 14 as in lid 10, bend zone 13' is created by reducing the resistance to bending by reducing the moment of inertia of the corrugations by lowering the tops of hills 22 such as by lateral depressions 14'. In this manner, panel 20' will first buckle upwards at bend zone 13' at bend failure from compression load. As previously described, panel 20' is predisposed to buckle upwards upon failure in bending mode, and the lateral weakening at bend zone 14' controls the bending to first occur along bend zone 13'.

Lid 10 is made of sufficiently resilient material so as to spring back and return to its original configuration after being buckled. Polypropylene and/or other thermoplastic olefin material has been found to produce good results.

Because lid 10 buckles upward in failure mode, gravity assists in returning the buckled lid 10 to its original configuration. Thus, since a buckled lid is typically still supported along a left or right side by the bin, gravity on the raised part will tend to straighten the lid and return the lid to its original configuration

Lid 10 is adapted, such as by having a smoothly arched top surface, for shedding water and snow off the container and not into the bin.

Lid 10 is adapted to be nestably stackable. As seen in

Figure 4, lid 10 includes nubs or protrusions 45 on lower side 40 for maintaining nested, stacked lids 10 in a parallel relationship. Protrusions 45 assure that a stack of lids 10 maintains vertical alignment and they prevent nested lids 10 from becoming stuck together.

Figure 9 is a sectional view taken on line 9-9 of lid 10 of Figure 3 further including additional identical lids 10a, 10b in nested, stacked configuration. Figure 10 is a sectional view taken on line 10-10 of lid 10 of Figure 3 further including additional lids 10a, 10b in nested, stacked configuration. As can be seen, protrusions 45 are adapted for maintaining nested, stacked lids 10 in a parallel relationship.

Although a particular embodiment of the invention has been illustrated and described, various changes may be made in the form, composition, construction, and arrangement of the parts herein without sacrificing any of its advantages. Therefore, it is to be understood that all matter herein is to be interpreted as illustrative and not in any limiting sense, and it is intended to cover in the appended claims such modifications as come within the true spirit and scope of the invention.